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# SCAN DR SYSTEM

2010



*JSB Medics Co., Ltd.*



CE  
0434



*JSB Medics Co., Ltd.*

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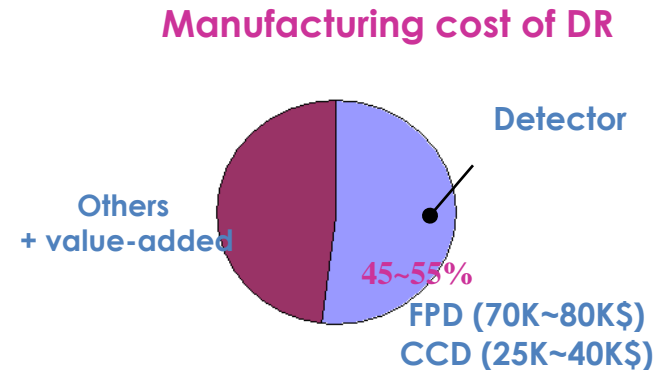
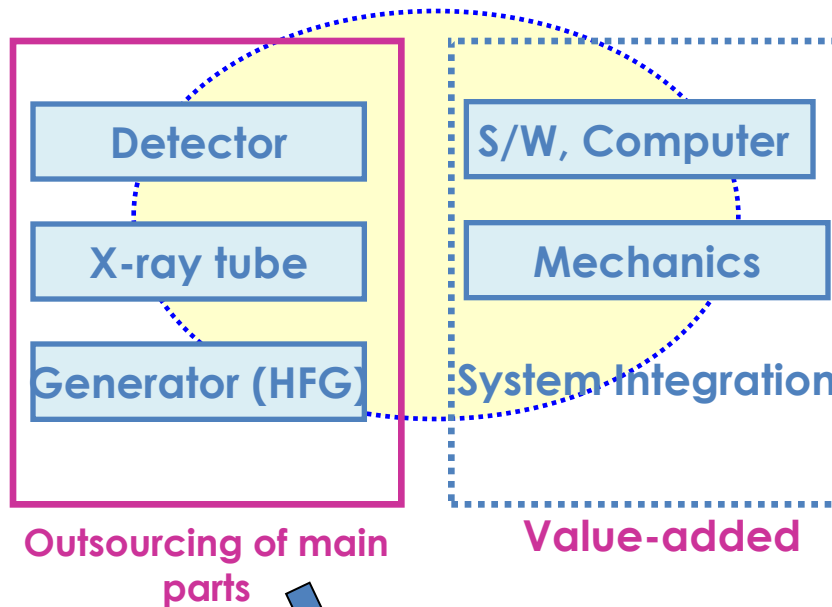
### Development of Detector and X-ray System

- Research for high performance detector
- Application study for efficient radiography system
- Low dose radiography
- Design for mechanics of radiography system
- Development of medical image Software
- Development of X-ray image acquisition system
- Imaging processing software based on DICOM



# I. Business Approach to Digital Radiography

## Composition of DR System



Pre-occupied by major companies

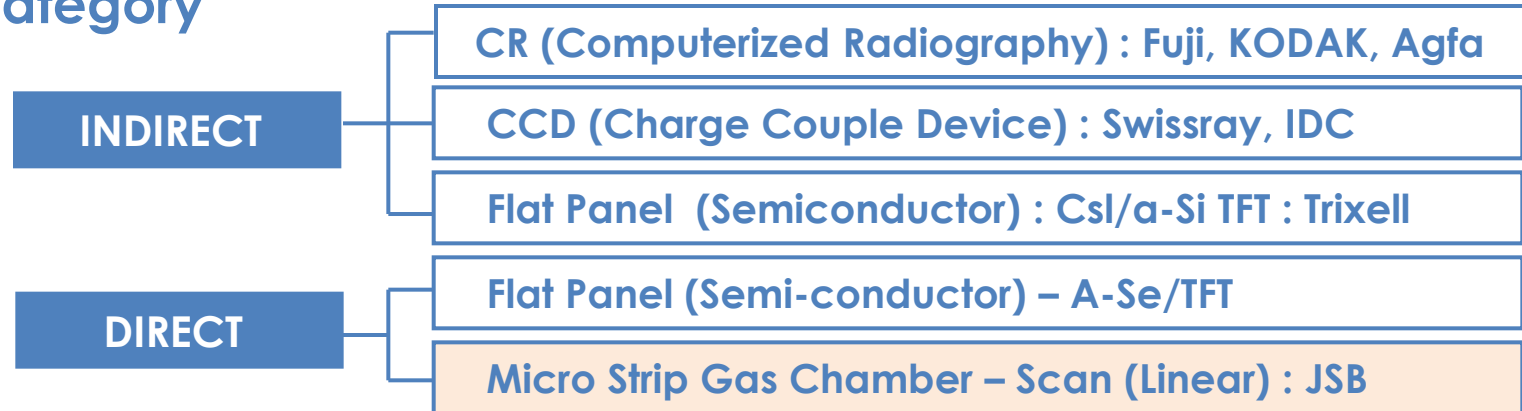
Severe competition & low profits

## Conclusion of JSB

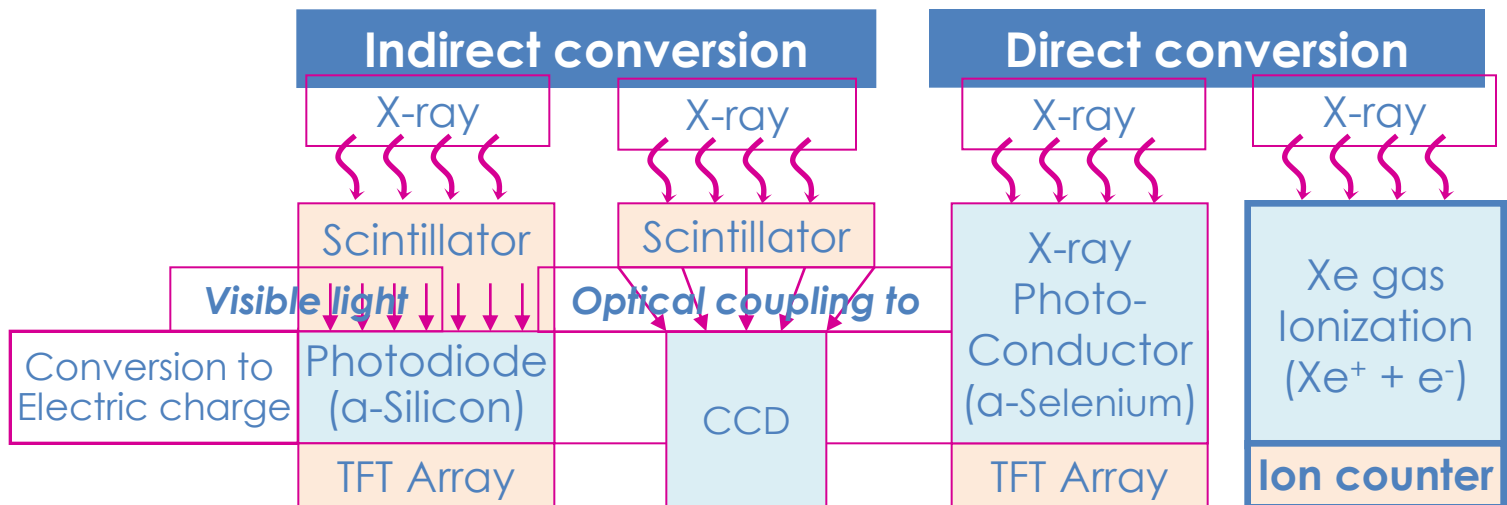
How we can penetrate the market ? ➡ **Scan type with our own detector**

## II. Digital Radiography (DR)

### 1. Category



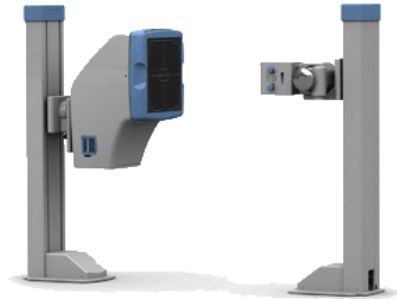
### 2. Conversion principle



## II. Digital Radiography (DR)

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### CCD DR



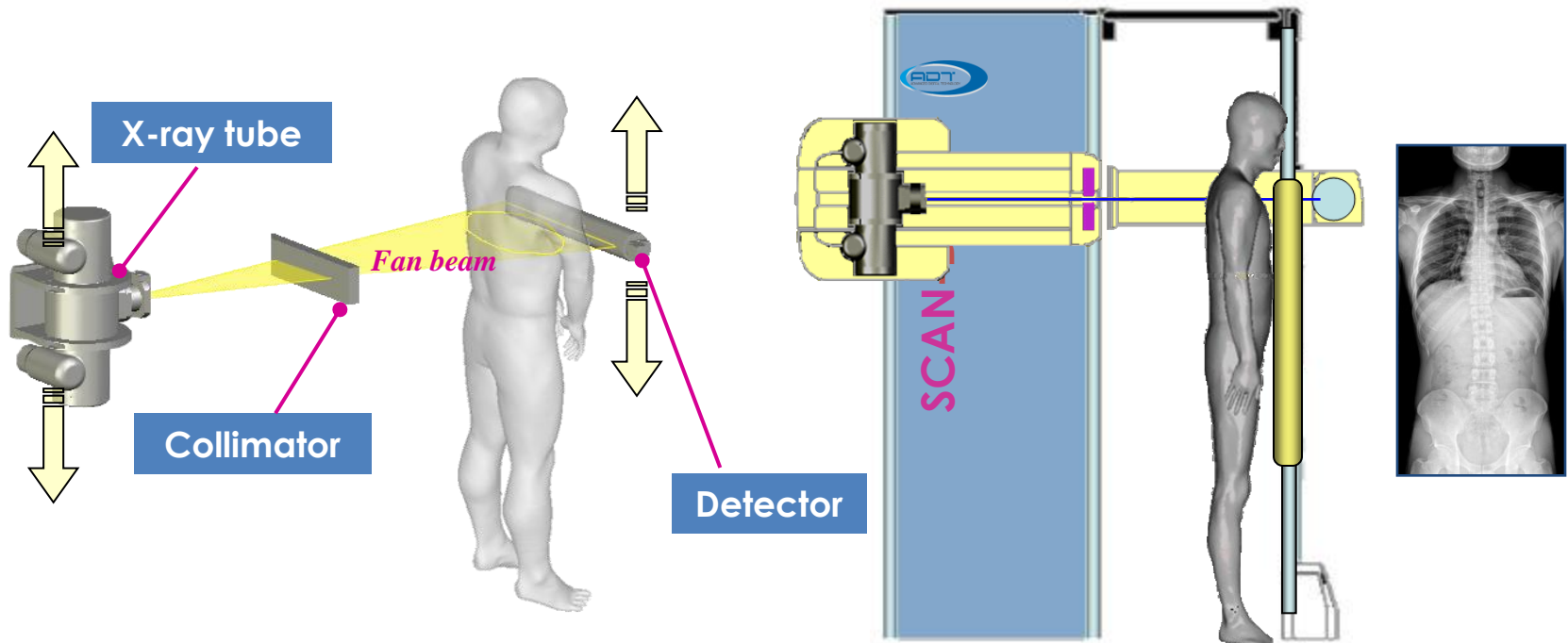
### FPD(Flat Panel Detector)

Indirect (scintillator +  $\alpha$ -Si : TFT )/ Direct conversion (  $\alpha$ -Se:TFT)



# III. The Concept of JSB's Scan DR System

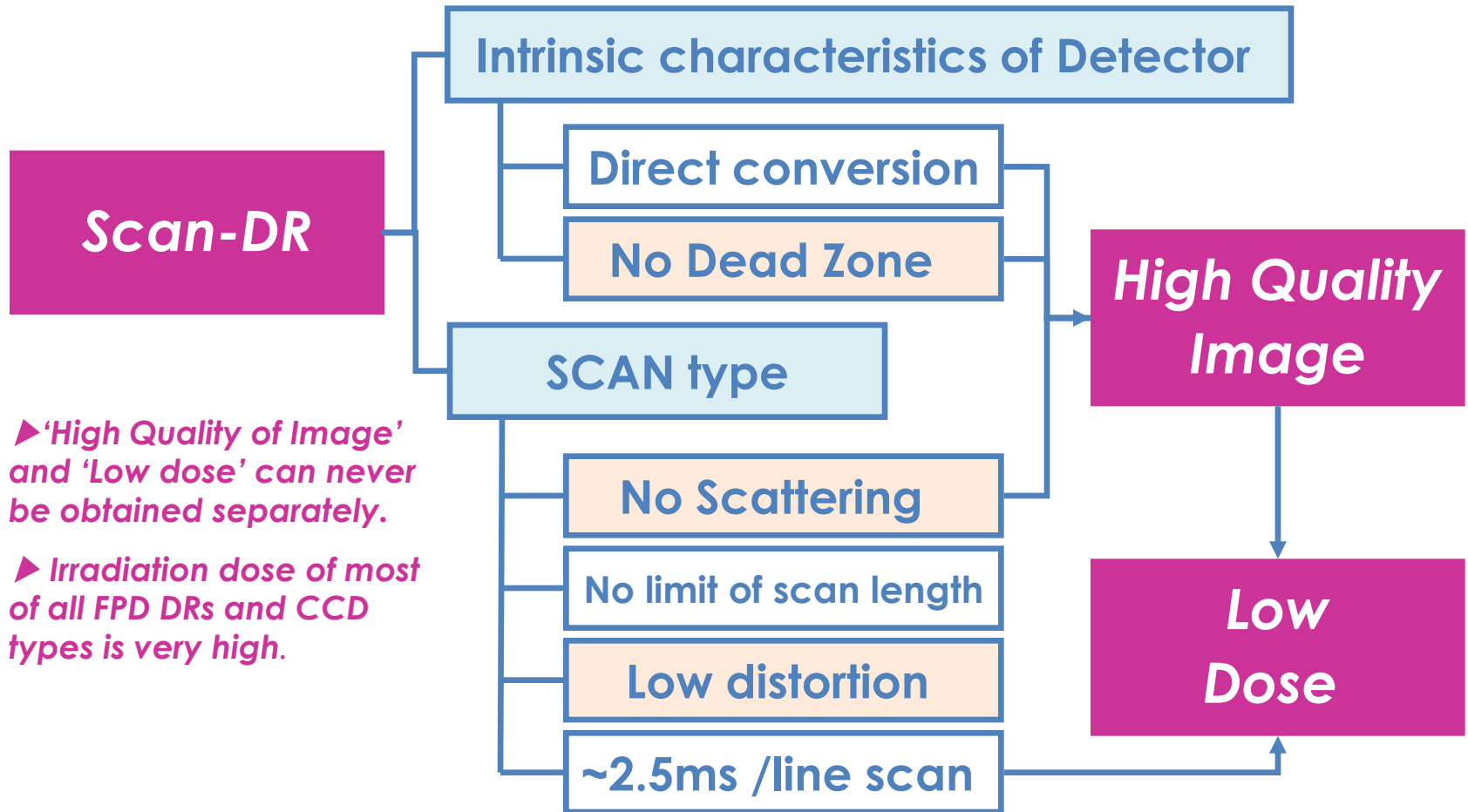
## 1. Operation of Scan DR



Digital radiography image is taken through a linear detector which is moving with fan beam formed by the collimator

# III. The Concept of JSB's Scan DR System

## 2. Characteristics of Scan DR





# IV. Advantages of JSB Scan DR

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## 1. Economical installation and operation

- ▶ Installation cost :  $< 1/3$  of FPD
- ▶ Long life time with consistent image quality
  - ▷ Warranty of detector : 1 years
  - cf.) Life time of FPD : 2~3 years
  - ▷ No aging effect of detector such as dead pixels and decrease of sensitivity
- ▶ Strong structure against harsh operating environment such as tough handling, vibration and temperature
- ▶ Low maintenance cost : low price of detector

# IV. Advantages of JSB Scan DR

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## 2. Low Radiation dose

- ▶ radiation dose / chest :  $< 1/3$  of others
- ▶ safe to children and pregnant women
- ▶ negligible dose to operator

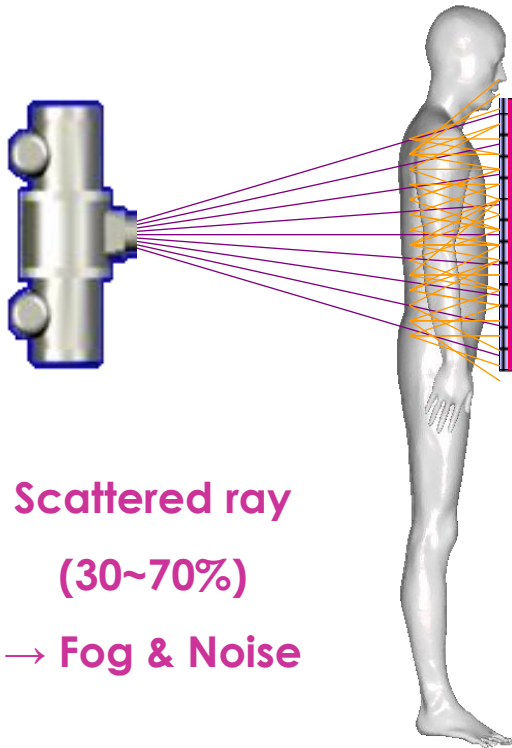
### Why ?

- ▷ Scattered radiation is very low due to usage of fan beam → no need of grid → low exposure energy
- ▷ Exposure time is very short
  - ex )  $\text{exposure time} = \text{thickness of fan beam} / \text{scan speed}$   
 $= 0.8\text{mm} / 200\text{mm/sec.} = 1 / 250 \text{ sec.}$
  - cf. ) other radiography system :  $1/20 \sim 1/5 \text{ sec.}$

## IV. Advantages of JSB Scan DR

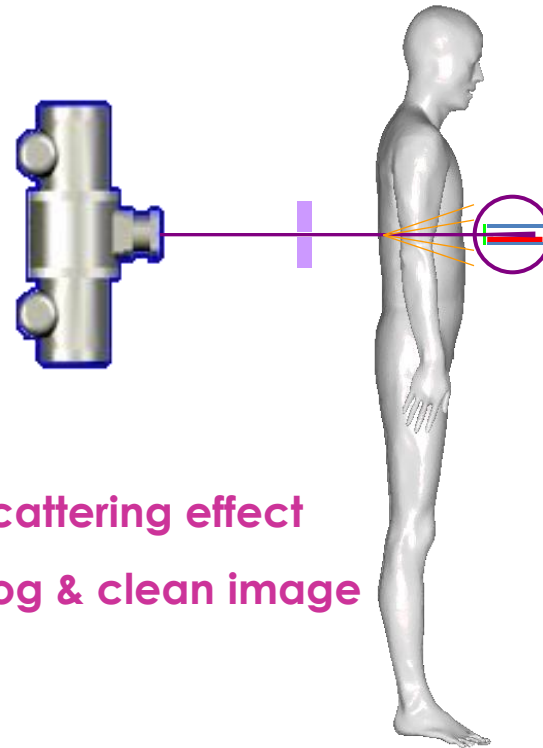
### ► Scattered radiation

Flat Panel Detector/ Film



Scattered ray  
(30~70%)  
→ Fog & Noise

JSB Detector



No scattering effect  
→ No fog & clean image

# IV. Advantages of JSB Scan DR

## 3. Long image size with single exposure

- ▶ Image size : 16" × ~ 39" (410 × ~ 990mm)  
- 2048 × 5710 pixels
  - ▶ enable to get whole spine or long bone image within 10 sec. including image processing
  - ▷ Real size of spine or bone at the direction of scan
- ▶▶ **Very convenient and high working efficiency for chiropractic and orthopedic application**



# V. Comparison of working efficiency *Clinical evidence*

Comparison to CR with respect to working efficiency

- Presented by Samsung Medical Center



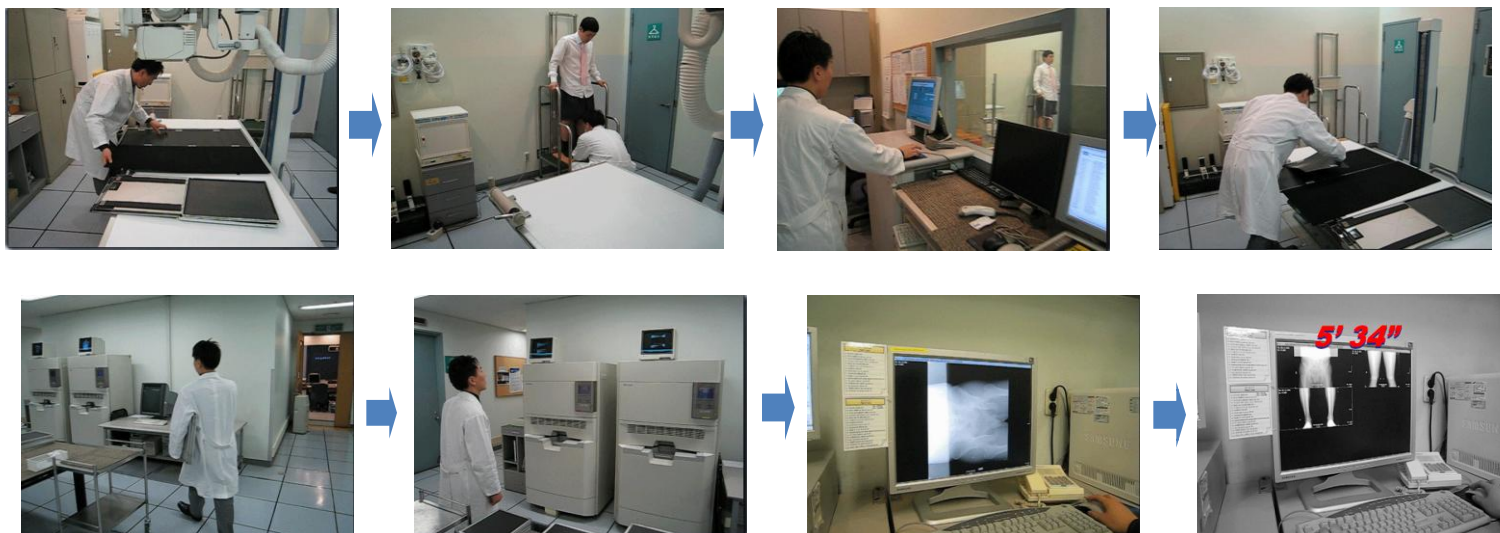
	CR	DDR Inventor-V
Exam. period	July 1,2005~June 30, 2006	July 1,2006~June 30, 2007
long bone	6,262 patients	7,171 patients
whole spine	1,986 patients	2,199 patients

## V. Comparison of working efficiency between CR and JSB Scan DR system

*Clinical evidence*

### Procedure for long bone exam. in the CR system

To achieve the image, 3 image plates (size 14" X 17") were inserted in a cassette (size 17" X 43") and exposure one time.



## V. Comparison of working efficiency between CR and JSB Scan DR system

*Clinical evidence*

### Procedure for whole spine series exam. in the CR system

To achieve the image, 2 Image plates (size 14" X 17") were inserted in the cassette (size 14" X 36") and exposure one time.



Whole spine series : PA + Lateral

## Clinical evidence

To achieve the image, continuous scan (3~5 sec.) is performed. According to the patients' body length, the tube and detector moved at the same time with fan beam.





## V. Comparison of working efficiency between CR and JSB Scan DR system

*Clinical evidence*

► Samsung Medical Center saved **56 + 28 days for a year** with  
JSB's SCAN DR System

	Examination	CR (05.07.01~06.06.30)	DDR Inventor-V (06.07.01~07.06.30)
Exam. time per patient (sec) [including patient preparation time]	Long bone	<b>334 sec.</b> (5min 34sec)	<b>67 sec.</b> (1min 07sec)
	Whole spine series	<b>510 sec.</b> (8min 30sec)	<b>101 sec.</b> (1min 41sec)
Average exam. time per 1 day (sec)	Long bone	8049.4 (2hour 14min 09sec)	1849.2 (30min 49sec)
	Whole spine series	3876 (1hour 04min 36sec)	858.5 (14min 18sec)
Total exam. time per 1 year (sec)	Long bone	2,091,508 <b>(72days 4hour 58min)</b>	480,457 <b>(16days 5hour 27min)</b>
	Whole spine series	1,012,860 <b>(35days 1hour 21min)</b>	222,099 <b>(7days 5hour 41min)</b>

*< 8 hours / day, 5 days / week, 260 days / year >*

## V. Comparison of working efficiency between CR and JSB Scan DR system

*Clinical evidence*

### ► Comparison of long bone Images



## V. Comparison of working efficiency between CR and JSB Scan DR system

Clinical evidence

### ► Whole Spine PA, Lateral

CR



Discontinuous image,  
Not exact scale

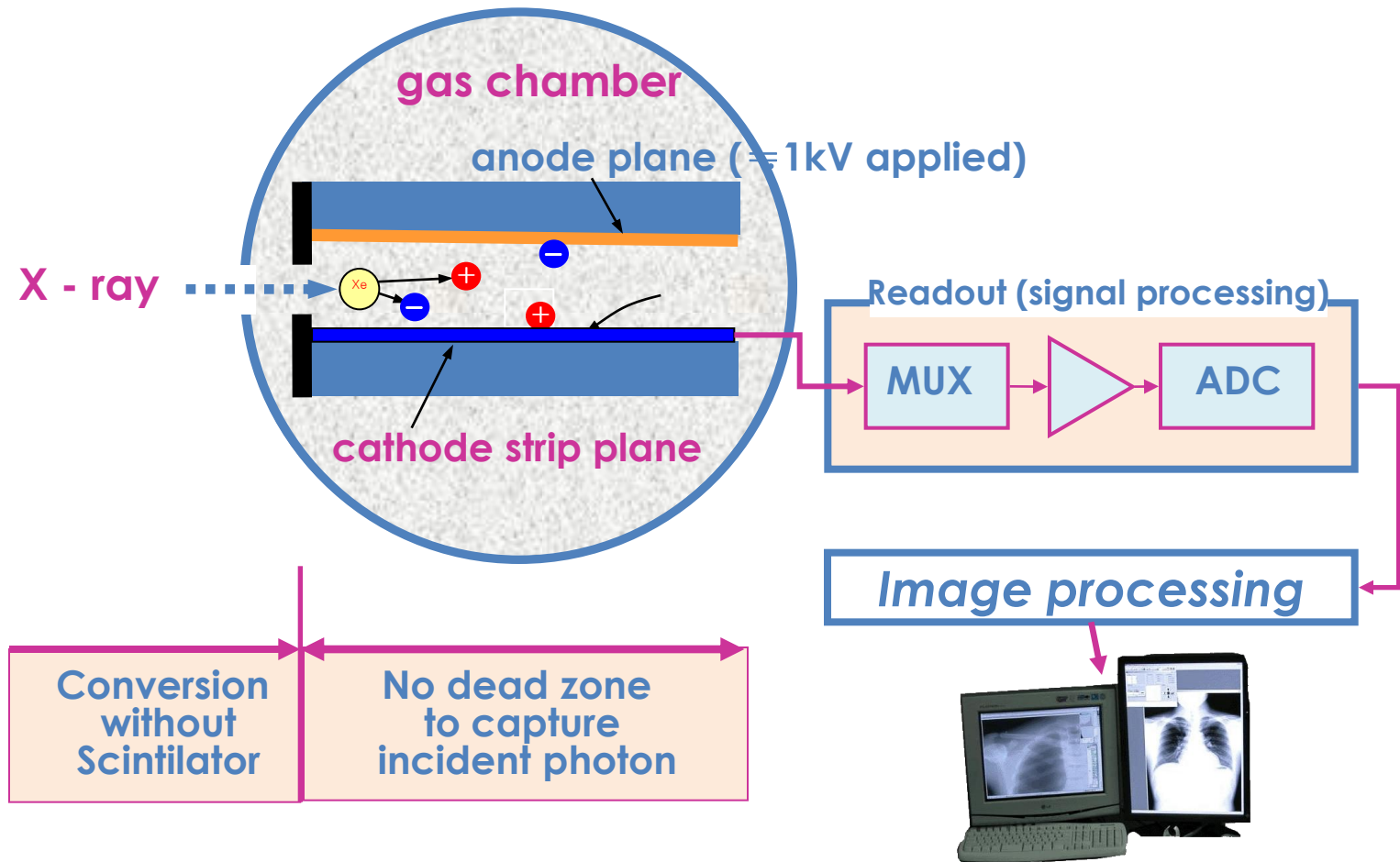
Scan DR



Continuous image

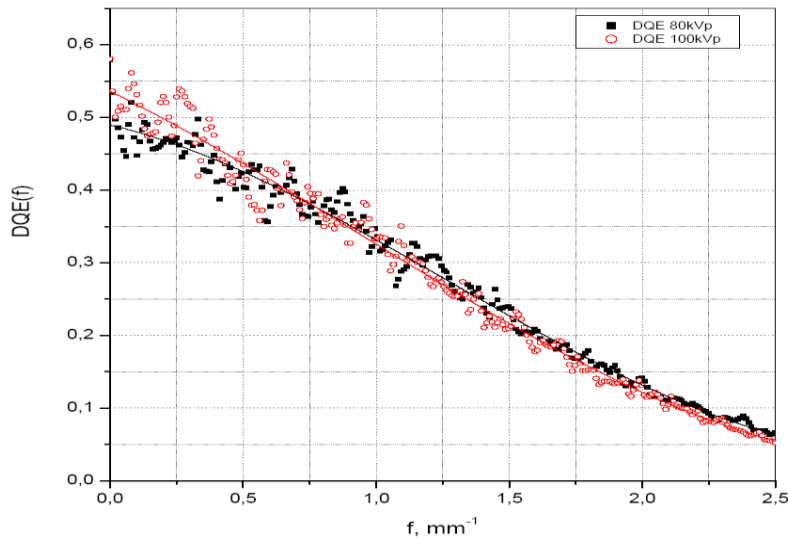
# VI. JSB's Detector and Products

## 1. Action of detector



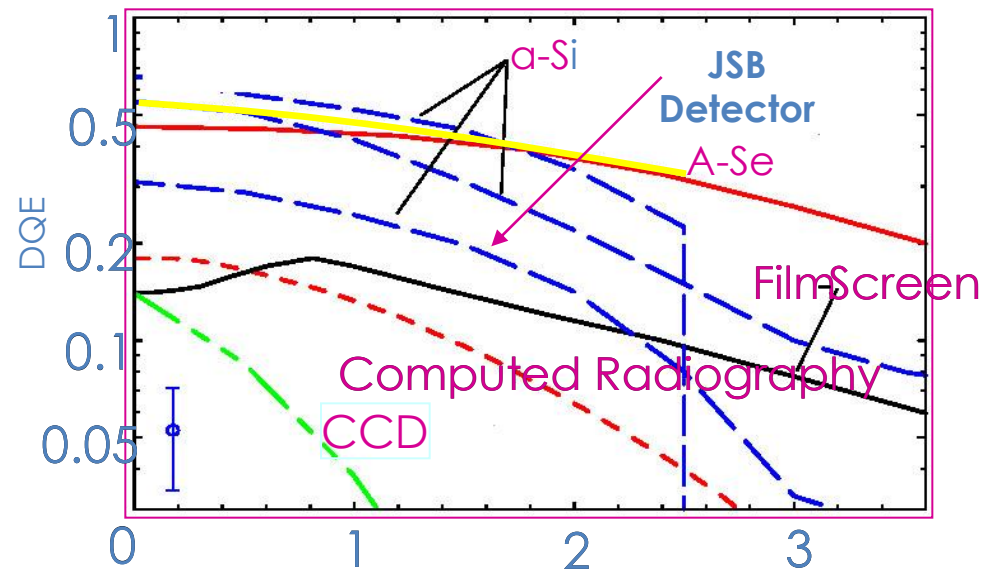
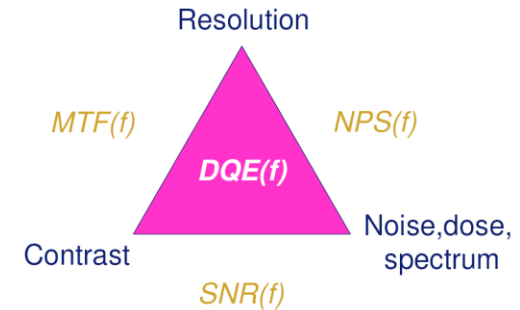
# VI. JSB's Detector and Products

## 2. DQE of JSB detector



$$DQE = \frac{SNR^2 \text{ at detector output}}{SNR^2 \text{ at detector input}}$$

Image Quality Triangle

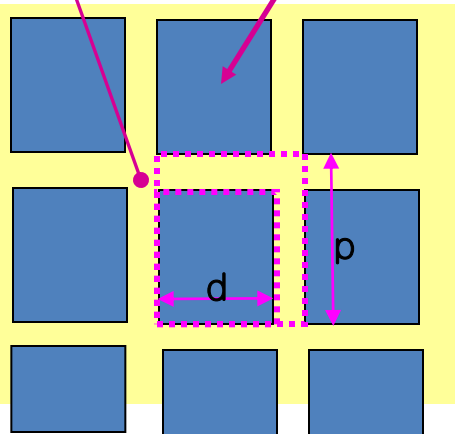


# VI. JSB's Detector and Products

## 3. No Dead Zone and High Fill Factor

### Flat panel detector

Dead zone      Sensing element

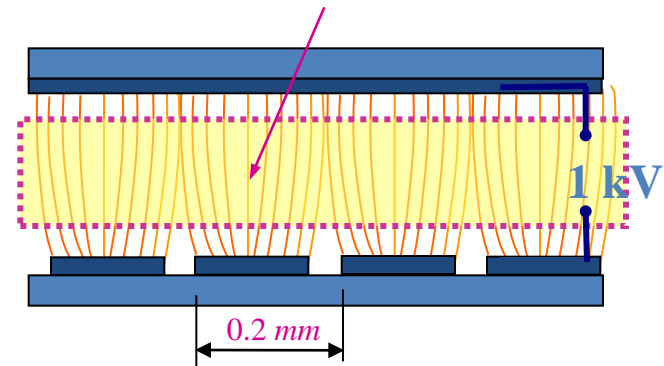


Fill factor =  $d^2/p^2$  :  $\sim 70,80\%$

→ Low image quality

### JSB detector

lines of electric force



High fill factor

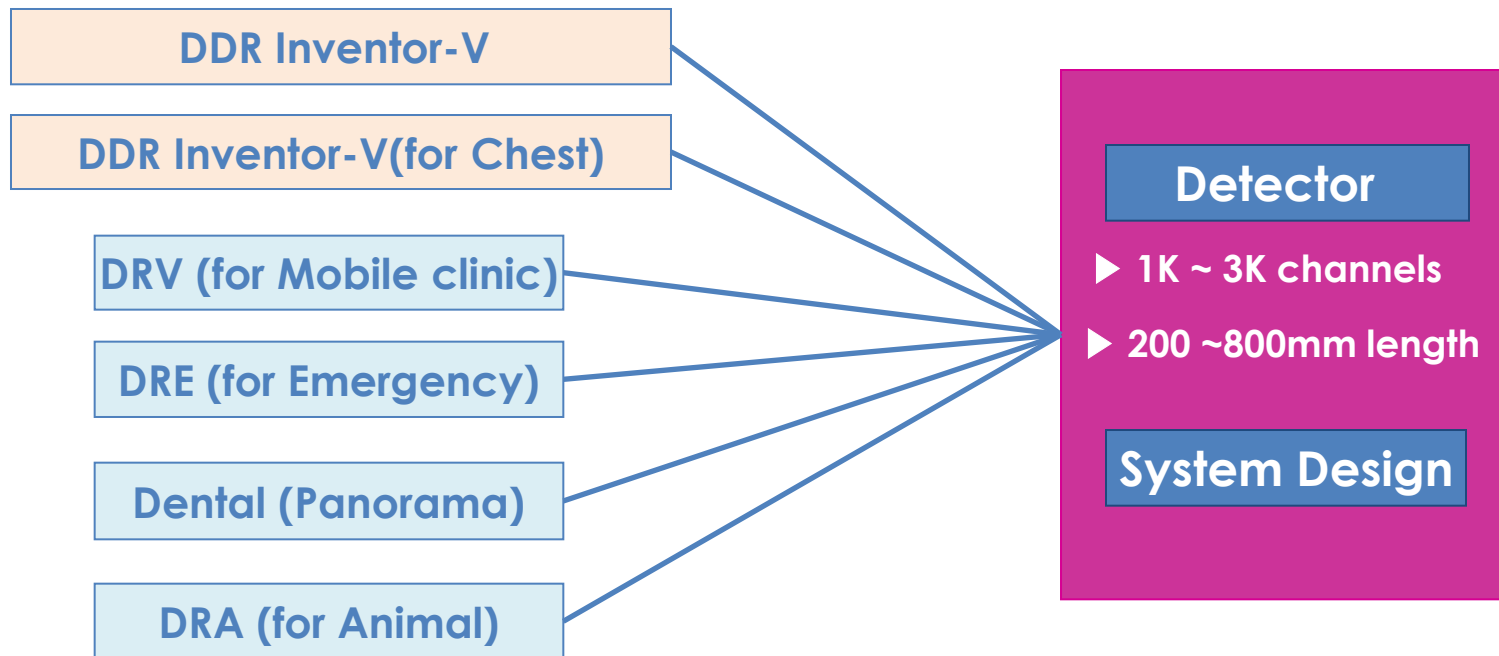
→ High image quality

# VI. JSB's Detector and Products

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## 4. Current products and application area

### Medical application



# VI. JSB's Detector and Products

## 5. Specifications

	DDR Inventor-V (for chest)	DDR Inventor-V
size of image	16"×17"(41×43cm)	16"×39"(41×99cm)
application	chest, skull, abdomen	chest, whole spine, long bone
	image size ≤ 430 mm	image size ≤ 1000 mm
pixel size	200/160/140 μm	200/160 μm
spatial resolution	2.5 lp/mm	2.5 lp/mm
scan speed	10/14/21 cm/sec.	10/14/21 cm/sec.
scanning time	2 sec.	5 sec.
X-ray tube	150kVp/500mA	150kVp/500mA
Generator	40 kW /1000 mAs	40 kW /1600 mAs
image acquisition time	<1 sec.	< 2 sec.
Gray scale	16384 (14 bit)	16384 (14 bit)



# VI. JSB's Detector and Products

## DDR Inventor-V (Chest)



*DDR Inventor- V enables to get long image like as whole spine and long bone with a shoot.*

## DDR Inventor- V



RSNA 2008



## VI. JSB's Detector and Products

### Reference sites



### Scan-DRM



### DDRInventor- V



<http://www.krta.or.kr/member/pds/kumsa/smc/html/main.html>



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## VI. JSB's Detector and Products

### Reference sites



### SNU Hospital : DDR Inventor-V (for Chest)



서울대학교병원  
SEOUL NATIONAL UNIVERSITY HOSPITAL

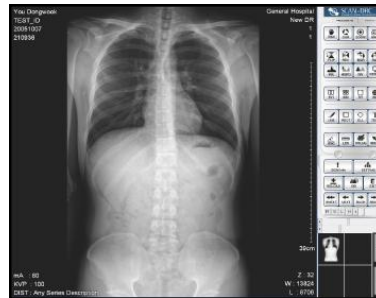
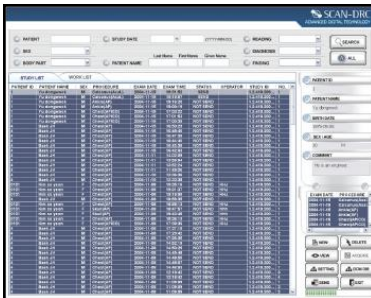


# VI. JSB's Detector and Products - Software

**DRWorks-C**



**DRWorks-M**



**DICOM 3.0  
support**

**File creation**

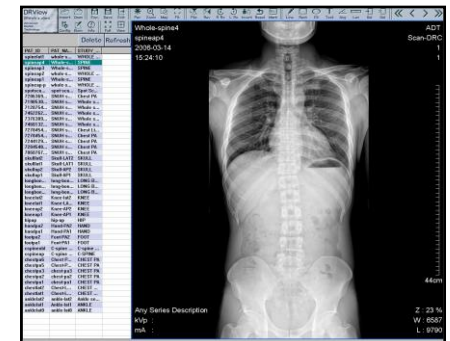
**C-store (storage SCU)**

**C-find (Worklist management)**

**Print SCU**

**DIR (make CD)**

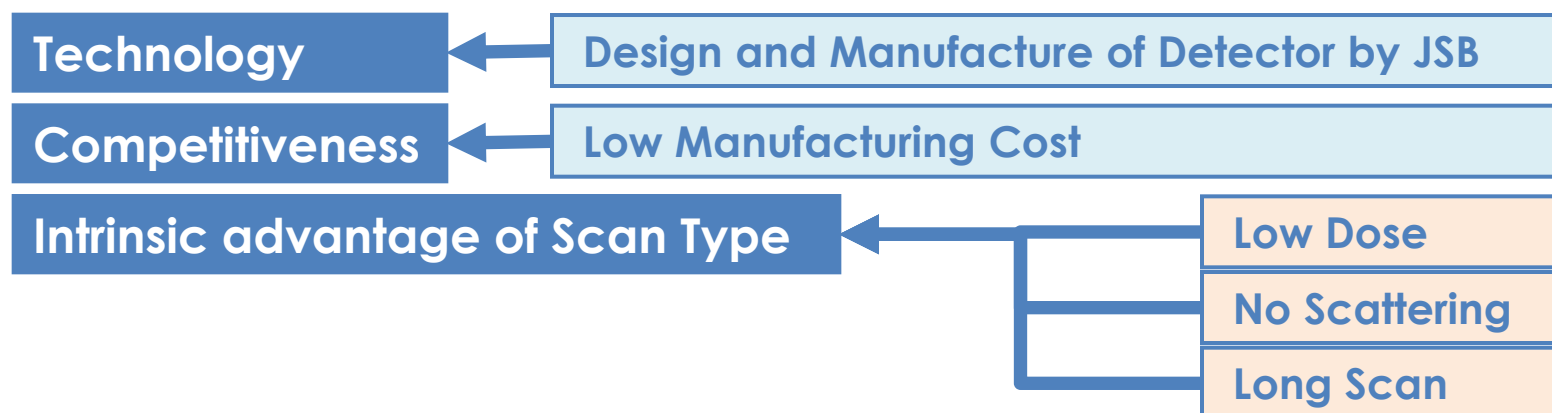
**JSB's software provides mini-PACS for small hospital and elementary image post - processing tool**



**DRView-Client**

# VII. Comparison of Digital X-ray System

## 1. Why JSB does adapt **SCAN type** DR ?



## 2. Digital X-Ray System Comparison

Manufacturer	JSB	Siemens	Canon	GE	Hologic	Swissary
Model	DDR Inventor-V	Thorax FD	CXDI-22	Revolution	DR-Throax	ddRChest
scintillator / detector	MSGC	Cesium Iodide / $\alpha$ -Si, TFT	Gadolinium Oxysulfide / $\alpha$ -Si, TFT	Cesium Iodide / $\alpha$ -Si, TFT	$\alpha$ -Se / $\alpha$ -Si, TFT	Gadolinium Oxysulfide /lens, CCD
size	41 × 99 cm	43 × 43 cm	43 × 43	41 × 41	35 × 43	35 × 43
pixel ( $\mu$ m)	200	143	160	200	139	169
Spatial resolution	2.5 lp/mm	3.5 lp/mm	3.1	2.5	4.6	3.0



# VII. Comparison of Digital X-ray System

## 3. Manufacturers of Scan type DR

maker	product type	detector	detector supplier
JSB	Chest General purpose Whole body scan	MSGC 200 $\mu\text{m}$ , 140 $\mu\text{m}$	In-house
LODOX	Horizontal scanning model only No chest model	CCD array	In-house assembly
ADANI (Belarus)	Chest General purpose Whole body scan	semiconductor scintillation detector 270 $\mu\text{m}$	In-house assembly
BAMS (China)	Chest General purpose	semiconductor scintillation detector 400 $\mu\text{m}$	In-house assembly
BIOSPACE		Gaseous microstrip detector 254 $\mu\text{m}$	In-house assembly



ADANI



BAMS



LODOX



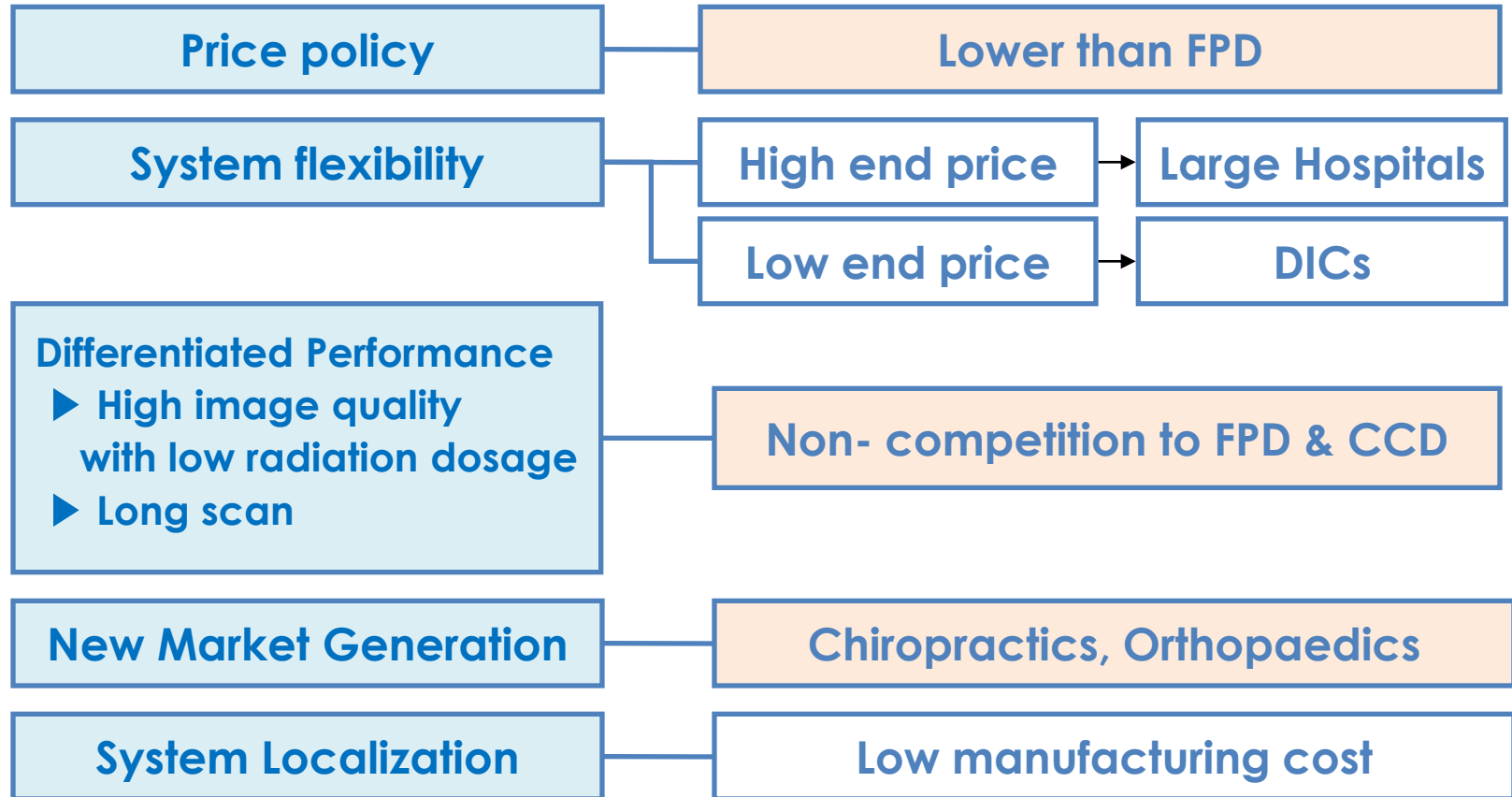
BIOSPACE

BAMS : BEIJING AEROSPACE ZHONGXING MEDICAL SYSTEMS CO.,LTD

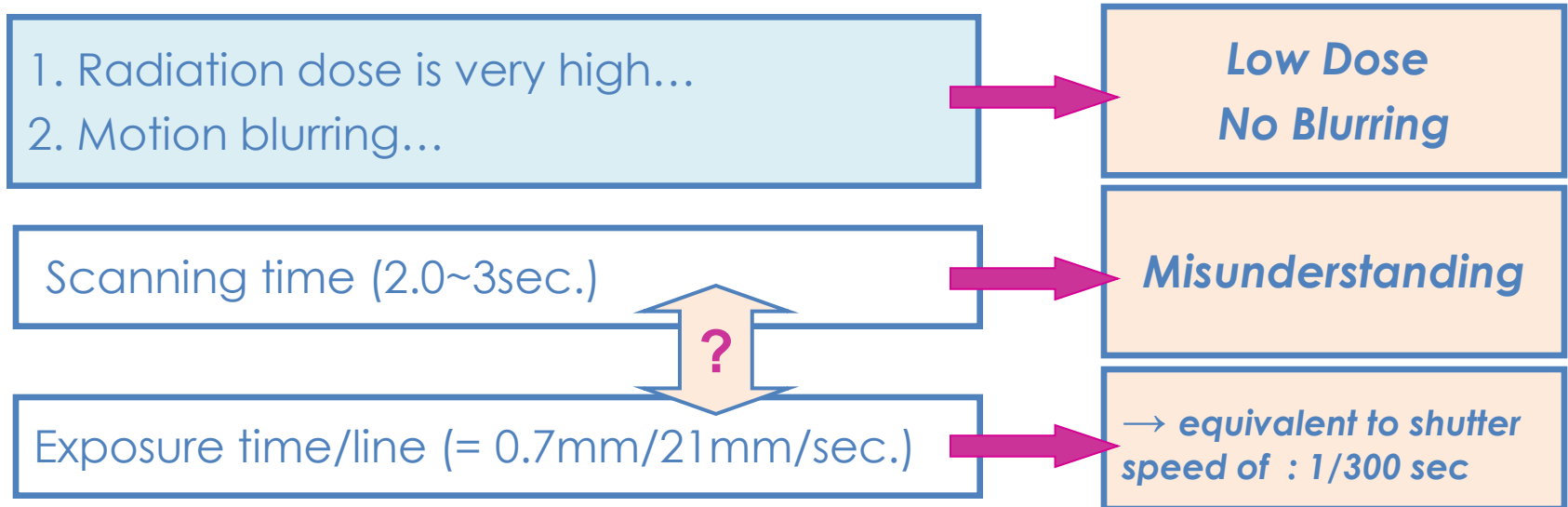
# VIII. Marketing Survey

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## Marketing Strategy



# IX. Misunderstanding about Scan type



**Scan speed of SCAN DR : 10,14,21cm/sec exposure time /line = 0.0035 sec.**  
**cf> exposure time of film screen or FPD or CCD = 0.01 ~ 0.1 sec.**



**Motion blurring can not be seen because relative speed between adjacent muscle or organs is very low**



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# THANK YOU



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